

# Solar Decathlon 2005

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# Solar Decathlon 2005

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## ABSTRACT

Solar Decathlon 2005 is a U.S. Department of Energy and National Renewable Energy Laboratory competition involving 19 colleges and universities from the United States, Canada, and Spain. These teams will compete to design, build, and demonstrate solar homes. In fall 2005, teams will transport their competition solar houses to Washington, D.C., where they will construct a solar village on the National Mall. When the houses are assembled, the teams will compete against each other in 10 contests (hence, a decathlon) for about a week. The contests range from design to comfort to energy performance. Each team must provide an aesthetically pleasing entry that produces sufficient solar energy for space conditioning, hot water, lighting, appliances, and an electric car. The Solar Decathlon is co-sponsored by BP, The Home Depot, the American Institute of Architects, the National Association of Home Builders, and the DIY Network. For more information, visit the Web site at [www.solardecathlon.org](http://www.solardecathlon.org).

## 1. Objectives

A key goal in the Solar Program Multi-Year Technical Plan (Task II.10) is to develop and facilitate widespread adoption of photovoltaics (PV) in the built environment, resulting in homes that use solar power, and businesses that demonstrate building-integrated PV and solar technologies in marketable applications. Adoption of PV in the built environment also leads to partnerships that build on successes. The Solar Decathlon is a biennial event to educate students, increase public awareness of the value of energy, and accelerate R&D. It demonstrates that the surface of a building can be used to generate enough energy to power all the heating, cooling, electrical, communication, and transportation needs of a home and a home business. It fosters collaborations among architects and engineers at the outset of their careers to achieve the goal of demonstrating building-integrated PV and solar technologies in marketable residential applications.

## 2. The 10 Solar Decathlon Contests

The Solar Decathlon consists of 10 contests that encompass all of the ways in which we use energy in our daily lives—at work, at home, and at play. Each contest is worth 100 points, except for Contest 1: Architecture, which is worth 200 points to emphasize the need for aesthetics and design excellence. New to the 2005 competition is Contest 2: Dwelling, which will be judged by a panel of experts from the residential buildings industry. The dwelling contest will award points based on livability, buildability,

reproducibility, affordability, and attractiveness of the houses to buyers.

### Contest 1: Architecture

A jury of distinguished architects will judge design, innovation, and aesthetics. More than 2,000 years ago, the Roman architect Vitruvius claimed that all buildings should possess the qualities of “firmness, commodity, and delight.” Architects today still adhere to those ideas. Good design incorporates structural integrity (“firmness”), function and comfort (“commodity”), and aesthetic appeal (“delight”). The Solar Decathlon homes must be functional, comfortable, structurally sound, and appealing. But the teams have to go further than that. They have to design and build attractive, high-performance houses that integrate solar and energy efficiency technologies seamlessly into the homes’ designs.

### Contest 2: Dwelling

A jury of experts from the real estate and buildings industries will judge livability and buildability. Do the houses have good consumer appeal? Are the spaces designed well for the tasks of everyday living, such as doing laundry and getting work done? Are the houses comfortable to live in and simple to care for? Are the houses’ features easily reproducible? And would the houses attract buyers? The building industry constantly adapts to changing lifestyles with new floor plans and new features. The Solar Decathlon homes are only 500 ft<sup>2</sup> – 800 ft<sup>2</sup>—that’s about one-third the size of a typical new single family home—but they must still be livable and meet the needs of today’s families.

### Contest 3: Documentation

The Documentation contest awards points based on how well the teams analyzed their designs for energy performance and how thoroughly they documented the design process. Teams must document all stages, including the schematic design, design development, construction, and “as-built” phases of the Solar Decathlon project.

### Contest 4: Communications

Panels of judges with expertise in communications and public relations will judge the teams’ Web sites and house tours. Points will be awarded based on the success of the teams in delivering clear and consistent messages and images that represent the teams’ visions and results. The Solar Decathlon is not only a competition, it is also a public event held on the National Mall. The Communications contest challenges teams to communicate their experiences to a wide audience: homeowners, energy and building

professionals, government decision makers, electricians, school kids, even the media. Through Web sites and public tours, the teams will share their stories and the knowledge they gain. Their experiences and their houses will serve as living demonstrations of using solar energy in the home.

#### Contest 5: Comfort Zone

This contest measures the effectiveness of the solar home's ability to provide interior comfort by controlling temperature and humidity. Full points will be rewarded for maintaining narrow temperature and relative humidity ranges inside the house. The home will also be measured for indoor environmental and air quality.

#### Contest 6: Appliances

This contest measures the effectiveness of the solar home's ability to power appliances. To earn points, student teams must maintain narrow temperature ranges in their refrigerators and freezers, wash and dry clothing, cook meals, use a dishwasher to clean the dishes, as well as leave the television on for six hours a day and the computer on for eight hours a day.

#### Contest 7: Hot Water

The Hot Water contest measures the effectiveness of the solar hot water systems. Each solar hot water system must be able to provide all the hot water for a typical home for bathing, cooking, running the dishwasher and the washing machine.

#### Contest 8: Lighting

This contest measures lighting levels and lighting quality and aesthetics. To win this contest, teams will have to supply ample interior lighting with as little energy as possible. As with other contests, the Lighting contest is designed to reproduce many elements of real-world living. For example, there should be sufficient levels of light in the kitchen and home office work areas, and exterior lighting should illuminate the house numbers and doors all night for increased safety and security. Teams can also earn points from a panel of judges that will subjectively evaluate the teams' lighting designs, which are required to integrate both electric and natural light, from both a functional and an aesthetic standpoint.

#### Contest 9: Energy Balance

The contest measures the effectiveness of the homes' solar systems to provide all energy needs. Teams must use only the energy they generate during the competition to provide all the energy for the contests. Teams earn full points if their battery systems have as much stored energy at the end of the competition as they did at the beginning.

#### Contest 10: Getting Around

This contest measures the effectiveness of the solar home to charge an electric vehicle. Points will be awarded based on how many miles each team is able to drive. The vehicle with the most miles wins contest ten. The typical American family uses as much energy driving their cars as

they do living in their homes. This contest demonstrates a clean energy solution to transportation, and illustrates to the public the total energy needs of the household.

### 3. The Teams

The Solar Decathlon organizers used a proposal system to recruit teams. A proposal ensures university commitment for a project of this size, and is used as a contractual agreement for the Department of Energy to provide \$5,000 of seed money to each team. Twenty-four colleges and universities submitted proposals early in 2003, and 20 were chosen. One team has since withdrawn, leaving a field of 19. The diversity of the entrants, from some of the country's elite schools of architecture and engineering, to a gritty mid-western two-year college, to a team building a Habitat for Humanity home, to international teams from Spain and Canada, should provide an exciting showcase. The following is the list of teams:

California Polytechnic State University – San Luis Obispo, California  
Carnegie Mellon, The Art Institute of Pittsburgh, and University of Pittsburgh, Pennsylvania  
Concordia University and Université de Montréal, Canada  
Cornell University, New York  
Crowder College, Missouri  
Florida International University, Florida  
New York Institute of Technology, New York  
Rhode Island School of Design, Rhode Island  
Universidad Politécnica de Madrid, Spain  
University of Colorado – Denver and Boulder, Colorado  
University of Maryland, Maryland  
University of Massachusetts – Dartmouth, Massachusetts  
University of Michigan, Michigan  
University of Missouri – Rolla and the Rolla Technical Institute, Missouri  
University of Puerto Rico – Mayagüez, Puerto Rico  
University of Southern California, California  
University of Texas at Austin, Texas  
Virginia Polytechnic Institute and State University, Virginia  
Washington State University, Washington.

### 4. Schedule

The entire 2005 event will take place over a 21-day period starting in fall 2005. Twenty-one days is the maximum length of time that use permits are given for the National Mall by the National Park Service. That means the villages has to be built, the competition held, and the village taken down in 21 days. Teams will have approximately seven days to build their houses on the Mall. The village will be open to the public, and the contest will be run, over an eleven-day period. Teams will then have just three days to disassemble their houses and depart the Mall.

During the contest, real-time data, competition standings, and photos will be available on the Solar Decathlon Web site at [www.solardecathlon.org](http://www.solardecathlon.org).

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